

CLAIMS

1. A method of determining alternans data of an ECG signal, the method comprising:
determining at least one value representing at least one morphology feature of each beat of the ECG signal;
generating a set of data points based on a total quantity of values and a total quantity of beats, the data points each including a first value determined using a first mathematical function and a second value determined using a second mathematical function;
separating the data points into a first group of points and a second group of points;
and
generating a feature map by plotting the first group of points and the second group of points in order to assess an alternans pattern of variation.
2. A method as set forth in claim 1 and further comprising determining an estimated amplitude of the alternans pattern of variation.
3. A method as set forth in claim 2 and further comprising determining an estimated amplitude by determining a first center point and a second center point of the data points and determining a distance between the first center point and the second center point.
4. A method as set forth in claim 1 and further comprising assigning the data points representing an odd beat to the first group of points and assigning the data points representing an even beat to the second group of points.
5. A method as set forth in claim 1 and further comprising:
generating a feature matrix based on the total quantity of values and the total number of beats; and
processing the feature matrix using a principal component analysis,
the principal component analysis generating principal component vectors and principal components,
the data points corresponding to at least one of the principal component vectors.

6. A method as set forth in claim 5 and further comprising determining an estimated amplitude of the alternans pattern of variation by calculating a square-root of at least one of the principal components.
7. A method as set forth in claim 1 and further comprising using the feature map to visually determine whether an alternans pattern of variation exists.
8. A method as set forth in claim 7 wherein an alternans pattern of variation exists if the first group of points are spaced from the second group of points and an alternans pattern of variation does not exist if the first group of points are not spaced from the second group of points.
9. A method as set forth in claim 1 wherein the first mathematical function and the second mathematical function each calculate a difference feature.
10. A method as set forth in claim 1 and further comprising:
 - generating a second set of data points, the data points of the second set including a third value determined using a third mathematical function and a fourth value determined using a fourth mathematical function;
 - separating the data points of the second set into a third group of points and a fourth group of points; and
 - generating a second feature map by plotting the third group of points and the fourth group of points.
11. A method as set forth in claim 10 and further comprising:
 - generating a third set of data points, the data points of the third set including a fifth value determined using a fifth mathematical function and a sixth value determined using a sixth mathematical function;
 - separating the data points of the third set into a fifth group of points and a sixth group of points; and
 - generating a third feature map by plotting the fifth group of points and the sixth group of points.

12. A method as set forth in claim 11 and further comprising comparing the feature map, the second feature map, and the third feature map to assess an alternans pattern of variation.

13. A method as set forth in claim 1 and further comprising:
processing the data points using a cluster analysis, the cluster analysis generating a first cluster of points and a second cluster of points;
comparing the first cluster of points with the first group of points;
comparing the second cluster of points with the second group of points; and
determining a value representative of matched points between the first cluster of points and the first group of points and matched points between the second cluster of points and the second group of points.

14. A method as set forth in claim 1 and further comprising assessing T-wave alternans data of the ECG signal.

15. A method as set forth in claim 1 and further comprising determining at least one value representing at least one non-amplitude-based morphology feature.

16. A method of determining alternans data of an ECG signal, the method comprising:
determining at least one value representing at least one morphology feature of each beat of the ECG signal;
generating a feature matrix based on a total quantity of values and a total quantity of beats;
processing the feature matrix using a principal component analysis, the principal component analysis generating principal component vectors and principal components; and
using data corresponding to at least one of the principal component vectors and the principal components to determine the alternans data.
17. A method as set forth in claim 16 and further comprising generating a feature map based on at least one of the principal component vectors.
18. A method as set forth in claim 16 and further comprising generating a spectral graph based on at least one of the principal component vectors.

19. A method of determining alternans data of an ECG signal, the method comprising:
determining at least one value representing at least one morphology feature of each beat of the ECG signal;
performing a statistical analysis using data points generated based on a total quantity of values and a total quantity of beats, the statistical analysis generating a confidence level;
and
determining whether the confidence level is significant.
20. A method as set forth in claim 19 and further comprising
processing the data points using a cluster analysis, the cluster analysis generating a first cluster of points and a second cluster of points;
comparing the first cluster of points with the first group of points;
comparing the second cluster of points with the second group of points; and
determining a value representative of matched points between the first cluster of points and the first group of points and matched points between the second cluster of points and the second group of points; and
wherein the confidence level is based at least in part on the value.
21. A method as set forth in claim 19 and further comprising
processing the data points using a paired t-test, the paired t-test generating a p-value,
and
wherein the confidence level is based at least in part on the p-value.
22. A method as set forth in claim 19 and further comprising
determining a first center point corresponding to a first group of points and a second center point corresponding to a second group of points; and
determining a distance between the first center point and the second center point, the distance representing an estimated amplitude of the alternans data.

23. A device for determining alternans data of an ECG signal, the device comprising:
- means for determining at least one value representing at least one morphology feature of each beat of the ECG signal;
 - means for generating a set of data points based on a total quantity of values and a total quantity of beats, the data points each including a first value determined using a first mathematical function and a second value determined using a second mathematical function;
 - means for separating the data points into a first group of points and a second group of points; and
 - means for generating a feature map by plotting the first group of points and the second group of points in order to assess an alternans pattern of variation.